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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MATTHEW A. PURDY

Appeal 2010-000050
Application 10/810,037[1]
Technology Center 2100

Decided: December 30, 2009

Before ST. JOHN COURTENAY III, STEPHEN C. SIU, and JAMES R. HUGHES, *Administrative Patent Judges*.

HUGHES, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] Application filed March 26, 2004. The real party in interest is Advanced Micro Devices, Inc. (App. Br. 3.)

STATEMENT OF THE CASE

Appellant appeals the Examiner's rejection of claims 1-5, 7-18, and 20-27 under 35 U.S.C. § 134(a). Claims 28 and 29 have been allowed, and claims 6 and 19 have been indicated as allowable. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

Appellant's Invention

Appellant invented an apparatus and method for predicting yield parameters of semiconductor manufacturing processes based on fault classification data. (Spec. 1, ll. 6-8; 5, ll. 11-18.)[2]

Representative Claim

Independent claim 1 further illustrates the invention. It reads as follows:

> 1. A method, comprising:
>
> receiving fault classification data associated with a tool fault condition, the tool fault condition being associated with a process tool for processing a wafer; and
>
> estimating at least one yield parameter of the wafer based on the fault classification data.

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[2] We refer to Appellant's Specification ("Spec."); Amended Appeal Brief ("App. Br.") filed August 24, 2007; and Reply Brief ("Reply Br.") filed January 15, 2008. We also refer to the Examiner's Answer ("Ans.") mailed November 15, 2007.

References

The Examiner relies on the following reference as evidence of unpatentability:

Hsieh	US 2003/0060916 A1	Mar. 27, 2003
Atkinson	US 2004/0029029 A1	Feb. 12, 2004
Satya	US 6,751,519 B1	Jun. 15, 2004 (filed Oct. 24, 2002)

Rejections

The Examiner rejects claims 1-5, 7, 8, 10-18, 20, 21, and 23-27 under 35 U.S.C. § 103(a) as obvious in view of Satya and Hsieh.

The Examiner rejects claims 9 and 22 under 35 U.S.C. § 103(a) as obvious in view of Satya, Hsieh, and Atkinson.

Appellant's Contentions

Appellant contends that the Examiner improperly rejected claims 1-5, 7, 8, 10-18, 20, 21, and 23-27 as obvious in view of the combination of the Satya and Hsieh references. Specifically, Appellant contends that:

> Independent claims 1, 14, and 27 include the general features of receiving fault classification data associated with a tool fault condition. The tool fault condition is associated with a process tool for processing a wafer. At least one yield parameter of the wafer is estimated based on the fault classification data.

(App. Br. 7.) And that "[n]either Satya nor Hsieh teach or suggest generating fault classification data for an identified fault condition, and then using that fault classification data to estimate yield parameters." (App. Br. 8). Appellant also contends that the combination of the Satya, Hsieh, and Atkinson references does not render the claimed subject matter of dependent

claims 9 and 22 obvious because "Atkinson fails to correct the defective teachings" (App. Br. 8) of the Satya and Hsieh references with respect to independent base claims 1 and 14. (App. Br. 8-9.)

Examiner's Findings and Conclusions

The Examiner finds that the prior art teaches each feature of Appellant's claims (Ans. 3-8), and maintains that each of the claims is properly rejected (Ans. 9-10). In particular, the Examiner finds that Satya teaches "receiving fault classification data associated with a fault condition," and "estimating at least one yield parameter of the wafer based on the fault classification data" (Ans. 4), and "that yield is predicted based on a particular type of defect" (Ans. 10.) The Examiner also finds that Hsieh teaches that "defect data of a wafer is associated with a process tool fault condition that is associated with a process tool for processing a wafer." (Ans. 4; *see also* Ans. 9.)

ISSUE

Based on Appellant's contentions, as well as the findings and conclusions of the Examiner, the pivotal issue before us is as follows.

Does Appellant establish that the Examiner erred in finding the Satya and Hsieh references collectively teach or would have suggested generating or receiving fault classification data associated with a tool fault condition that is associated with a process tool for processing a wafer, and estimating yield parameters of the wafer based on the fault classification data?

FINDINGS OF FACT (FF)

Appellant's Admissions

1. Appellant describes Satya's disclosure substantially the same as does the Examiner. (App. Br. 7.)

2. Appellant describes Hsieh's disclosure substantially the same as does the Examiner. (App. Br. 8.) Specifically, Appellant states that "Hsieh also measures wafer fault data. Hsieh tracks the tools that process a wafer so that wafer fault data can be linked back to a particular tool." (App. Br. 8.)

Satya Reference

3. Satya describes systems and methods for predicting semiconductor chip yields. Satya performs manufacturing processes including multiple fabrication steps on a semiconductor wafer lot. Satya then performs inspection procedures on the lot to obtain yield information and defect (fault) data. This data is utilized to determine yield parameters and predict product yields. (Col. 4, l. 43 to col. 5, l. 8.)

4. Satya explicitly describes "predict[ing] product yield for a particular defect type." (Col. 4, ll. 66-67.)

Hsieh Reference

5. Hsieh describes systems and methods for controlling production quality of a semiconductor wafer production line. Hsieh stores defect (fault) data, yield data, and work-in-process (WIP) data from various test instruments, and utilizes the data to control production quality. (p. 2, ¶¶ [0026]-[0030].)

6. Hsieh stores the relationships (associations) among the wafers and the manufacturing machines processing the wafers in the WIP database. When defect-prone wafers (wafers out of specification) are identified, Hsieh determines the machines processing the defective wafers and recalibrates or shuts down the machines. (p. 2, ¶¶ [0027]-[0030].)

PRINCIPLES OF LAW

Burden on Appeal

Appellant has the burden on appeal to the Board to demonstrate error in the Examiner's position. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("[o]n appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.") (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)).

Obviousness

A claimed invention is not patentable if the subject matter of the claimed invention would have been obvious to a person having ordinary skill in the art. 35 U.S.C. § 103(a); *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007); *Graham v. John Deere Co.*, 383 U.S. 1, 13 (1966). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art. *Graham*, 383 U.S. at 17. *See also KSR*, 550 U.S. at 407 ("While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.")

In *KSR*, the Supreme Court emphasizes "the need for caution in granting a patent based on the combination of elements found in the prior art," and stated that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 550 U.S. at 415-16. The Court explained:

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

Id. at 417. The operative question is thus "whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id.*

ANALYSIS

Based on Appellant's arguments in the Appeal Brief, we choose Appellant's independent claim 1 as representative. Appellant argues that each of independent claims 1, 14, and 27 includes "the general features of receiving fault classification data associated with a tool fault condition" (Appeal Br. 7), and Satya and Hsieh do not teach "generating fault classification data for an identified fault condition, and then using that fault classification data to estimate yield parameters" (App. Br. 8). Appellant does not address the differences among claims 1, 14, and 27, or otherwise argue the merits of the individual claims. Appellant separately discusses

dependent claims 9 and 22 (App. Br. 8-9), but merely states that the additional cited reference (Atkinson) doesn't cure the defects previously argued with respect to claim 1. We address only those arguments that Appellant presents in the Briefs. Arguments that Appellant could have made but chose not to make in the Briefs are waived. *See* 37 C.F.R. § 41.37(c)(1)(vii) ("Notwithstanding any other provision of this paragraph, the failure of appellant to separately argue claims which appellant has grouped together shall constitute a waiver of any argument that the Board must consider the patentability of any grouped claim separately.").

Satya describes a method for predicting semiconductor chip yield by inspecting and obtaining yield and defect (fault) data, and utilizing the data to determine yield parameters and predict product yields. (FF 3.) Satya explicitly describes predicting or determining yield associated with "a particular defect type." (FF 4.) Thus, we find that an ordinarily-skilled artisan would have understood Satya to describe a method for determining defect (fault) data associated with a particular defect (fault condition) and predicting yield parameters based on the data.

Hsieh describes a method for storing defect data, yield data, and the relationships (associations) among the wafers and the manufacturing machines processing the wafers. (FF 5.) Hsieh also describes identifying defective wafers and determining the machines that processed the defective wafers, i.e., associating defects with a particular machine. (FF 6.) Thus, we find that an ordinarily-skilled artisan would have understood Hsieh to describe a method for associating a defect (fault) with a semiconductor wafer processing machine (tool).

Appellant, however, contends that the Satya and Hsieh references do not teach generating "fault classification data" for a "tool fault condition" associated with a process tool and utilizing the "fault classification data" to estimate yield parameters. (App. Br. 8.)

The Examiner finds that Satya teaches generating or receiving defect (fault) classification data (associated with a defect (fault), or a defect (fault) condition), and predicting yield parameters based on the defect classification data. (Ans. 4, 10.) The Examiner also finds that Hsieh teaches wafer defect data associated with a process tool defect (fault) condition. (Ans. 4, 9.)

Appellant does not dispute the Examiner's substantive findings with respect to Satya or Hsieh. (FF 1, 2.) Accordingly, we decide the question of whether the Satya and Hsieh references collectively teach or would have suggested generating (or receiving) defect (fault) classification data associated with a tool defect (fault) condition associated with a process tool for processing a wafer, and estimating yield parameters based on the defect classification data.

We note at the outset, as a general proposition, merely reciting that data corresponds to a particular type of data, e.g., defect data, "tool fault condition" data or "fault classification data," as opposed to some other unique identifier, essentially constitutes non-functional descriptive material as it does not further limit the claimed invention either functionally or structurally. Such non-functional descriptive material does not patentably distinguish claims over the prior art that otherwise renders the claims unpatentable. *In re Ngai*, 367 F.3d 1336, 1339 (Fed. Cir. 2004).[3]

[3] *See also Ex parte Nehls*, 88 USPQ2d 1883, 1887-89 (BPAI 2008) (precedential) (discussing cases pertaining to non-functional descriptive

Appellant's contested limitation merely requires receiving (or generating) data (defect data) associated (somehow related) with a process tool. That the limitation recites the received (generated) data is a particular type of (particularly named) data associated with a "tool fault condition" – which we read as a particular machine issue producing particular types of defects – which is in turn associated with a process tool does not further limit the claim because the claim does not recite any functional or structural relationship among the tool fault condition, the fault classification data, the process tool, estimating yield parameters, and/or any other recited claim features. The claim does not describe how one type of data (tool fault condition data) is utilized to derive another type of data (fault classification data), only that the two are somehow related, and that the data is somehow related to a process tool.

We determine the scope of the claims in patent applications not solely based on the claim language, but upon giving claims "their broadest reasonable interpretation consistent with the [S]pecification" and "in light of the [S]pecification as it would be interpreted by one of ordinary skill in the art." *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004) (citations omitted). Appellant does not explicitly define the terminology "fault classification data" or "tool fault condition," but does explain that: "[i]n general, the fault detection unit 120 identifies fault conditions in the manufacturing system" (Spec. 9, l. 25 to 10, l. 1), "the fault classification

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material); *Ex parte Mathias*, 84 USPQ2d 1276 (BPAI 2005), *aff'd* by *In re Mathias*, 191 Fed. Appx. 959 (Fed. Cir. 2006) (Rule 36, unpublished); *Ex parte Curry*, 84 USPQ2d 1272 (BPAI 2005) (informative), *aff'd by In re Curry*, No. 2006-1003 (Fed. Cir. 2006) (Rule 36, unpublished) (both cases treating data as nonfunctional descriptive material).

unit 140 classifies the identified faults" (Spec. 10, ll. 1-2), and the functions of these units may be combined – "[f]or example, the fault detection and classification units 120, 140 and/or the yield estimation unit 160 may be combined into a single unit" (Spec. 10, ll. 9-11). Thus, we interpret "fault classification data associated with a tool fault condition" to mean a data indicative of a defect associated with a semiconductor processing device that has been classified. More broadly we interpret this classified defect data, without some additional limiting features, to merely mean data, as discussed *supra*. Such a broad construction is particularly warranted in view of Appellant's disclosure that the units may be combined. Accordingly, we broadly but reasonable interpret the disputed limitation to mean requesting or receiving data associated with a semiconductor wafer processing tool.

After reviewing the record on appeal, we find the combination of the Satya and Hsieh references collectively teaches or would have suggested the disputed limitation. We agree with the Examiner that Satya teaches each of the recited features except defect data associated with a semiconductor wafer processing tool, and we find Hsieh teaches or would have suggested this feature. (*See* FF 5). We are not persuaded by Appellant's contrary arguments that the Satya-Hsieh combination does not teach classifying defect data for a particular defect associated with a processing tool, and using the classified defect data to estimate yield parameters.

As we previously explained, Appellant does not separately argue dependent claims 9 and 22.

For the foregoing reasons, Appellant has not persuaded us of error in the Examiner's obviousness rejections of claims 1-5, 7-18, and 20-27. Accordingly, we affirm the Examiner's rejections of these claims.

CONCLUSION OF LAW

On the record before us, we find that Appellant has not established that the Examiner erred in finding the Satya and Hsieh references collectively teach or would have suggested generating or receiving fault classification data associated with a tool fault condition that is associated with a process tool for processing a wafer, and estimating yield parameters of the wafer based on the fault classification data.

DECISION

We affirm the Examiner's rejections of claims 1-5, 7-18, and 20-27 under 35 U.S.C. § 103(a).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

rwk

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